From two to eight drops of the tincture in a small quantity of water constitute an ordinary dose, which should not be repeated more frequently than every twenty-four or forty-eight hours.

We have now finished a very imperfect sketch of the highly interesting contents of the first volume of Dr. Jörg's publication; our readers will no doubt be equally anxious with ourselves for the receipt of the succeeding volumes. A similar course of experiments with those now before us, performed in relation to the remaining articles of the materia medica, will afford to the future inquirer the most valuable data to direct him in his investigations into the remedial properties of the agents best adapted for the cure of disease.

D. F. C.

XII. *The Principles of Medicine, founded on the Structure and Functions of the Animal Organism.* By Samuel Jackson, M. D. Assistant to the Professor of the Institutes and Practice of Medicine and Clinical Practice in the University of Pennsylvania. Carey & Lea, Philadelphia, 1832. pp. 612. 8vo.

THE present may be truly regarded as an important epoch for medical science. The new and important destinies created for it by the discoveries of Bichat, have extended their influence into all its ramifications, and the lights of general anatomy, while they have served to extricate us from the mazes of hypothesis, in which we were before involved, are daily unfolding to us new truths, eliciting new discoveries, and opening the way to new investigations. Under its impulses, and aided by its principles, the science of medicine has already become, in a great degree, freed from the paralyzing influence of mysticism, and the bewilderings of hypothesis, and is making rapid advances to the condition of a science of fixed principles. Its votaries are no longer content with the unmeaning jargon of the schools, and instead of seeking for the characters of disease in some unknown essence diffused throughout the organism—in the mischievous operations of some archæus, or in the mysteries of the vis medicatrix naturæ, they have become at length impressed with the important conviction, that an acquaintance with structure, and a careful investigation of its healthy and diseased properties, can alone conduct to correct principles in medicine, and constitute the only legitimate grounds of rational therapeutics. Anatomy, physiology, and pathology, are the main pillars of medical science, and any superstructure which is not constructed upon them, however highly it may be decorated, will be no more durable than the mere cobweb ornaments of speculation, and will speedily crumble into ruins before the vanquishing influence of truth and reason. A knowledge of structure and its laws must constitute the starting point of all successful medical inquiries, and so long as we suffer ourselves to be conducted by the lights afforded by that knowledge, we may be sure of not becoming lost in a vortex of visionary speculation; that we are in the only road to truth; and that in the end success will crown our exertions. This it is that constitutes the basis of *physiological medicine*, and these are the principles which it is the object of its votaries to keep constantly in view in all their inquiries. Amongst the great number who have enlisted under this banner, within late years, few have adhered more closely to these rules than the author of the treatise which we now propose to review; with what success will be seen by the issue.

The entire material creation is divided into two parts, which, though to a certain extent influenced by the same agencies, are nevertheless characterized by attributes so dissimilar, and undergo changes so much at variance with each other, that they "stand opposed in almost every characteristic trait." The first of these divisions, which is by far the most extensive, is composed of inorganized or dead matter, merely bound together by a mechanical aggregation of particles, possessing within themselves no power of motion or change, but influenced solely by physical and chemical laws. These particles of matter have no living principle to influence their compositions and decompositions; they give rise to no vital manifestations, and are only endowed with a correlative power of attraction or repulsion, in virtue of which, they mutually attract each other and unite, or are reciprocally repulsed and broken asunder. The second department is composed of objects endowed with higher powers, and susceptible of higher destinies. Living organized matter is its constituent element, and this, though influenced also by the same physical and chemical laws; though its particles are, to a certain extent, obedient to the same play of affinities, it is, besides, endowed with a property whose power and extent of influence are supreme; which presides over and controuls the development of the organic molecules, shapes and determines the whole of the organization, provides for its wants, protects it against the influence of unfriendly agencies, and secures it against decay by transmitting it from generation to generation—"whose generality of action, composes the vital or organic laws, or laws of living matter."

"In both these extensive divisions," says our author, "matter in its ultimate elements is the same, but differs entirely as to its forms and properties; they are infinitely more numerous in unorganized than in organized matter. The duration of the forms that matter assumes, and the properties it acquires in its inorganized state, is indefinite; they may exist from a few moments to a thousand ages. But in organized matter its forms and properties have a limited existence; a period is allotted to each, beyond which it cannot be continued."

But it may be useful to point out more fully the properties and characteristics of these two grand divisions of the material world, and to contrast them more particularly with each other.

Inorganized, or brute matter, has no specific characters of individuality,* except in its integrant molecules: the external form which it is capable of assuming, its volume, and its duration have nothing fixed and constant, and have no established or allotted period of existence. In organized matter, on the contrary, the specific characters are always determined by, or founded upon, the order and disposition of the molecules, which are always moulded into determined forms, and which, under these forms, are only allowed a limited and determined period of existence.

Inorganic bodies have their origin merely in a mechanical aggregation or juxtaposition of particles, and their growth is only effected by a gradual accumulation upon their surface. Organized or living bodies, on the contrary, are derived, with a few exceptions, from a preëxisting being of a similar kind, by the separation and progressive development of a germ, or a portion of its substance, previously prepared by the process of fecundation: their growth is internal, or is accomplished by the interstitial deposition of molecules.

The particles of which the one is composed are derived from the dissolution, or the wear and attrition of other bodies. They are united into aggregate masses, without any previous preparation, form no primitive arrangement by which an interior organization is developed, and exhibit nothing regular in their disposition, except what results from the physical and chemical laws which regulate the common attraction of aggregation and the phenomena of crystallization. The particles which enter into the formation of the other are prepared by itself; they are alternately deposited and removed, according to the exigencies of the laws of the living organization; they build up and sustain the vital structures, contribute for a definite period to the growth of the organs, maintain them for a certain time in the condition which constitutes their specific characters of individuality; are modified by all the external agencies which influence the category of vital phenomena, and only yield themselves up to the exclusive dominion of physical and chemical agencies, or assume the character of inorganic matter, after they have been forsaken by the vital principle which served to animate them.

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* Lamarck, Animaux sans Vertebres, Tom. I. p. 33.

Inorganized matter being merely influenced by physical and chemical laws—submitted to the processes of composition and decomposition, according as its particles attract or repel each other, is independent of the necessities of the preservation of its individuality, has no specific characters to propagate or transmit, and is hence not limited to any period of duration, or obliged to undergo any regular and specific stadia, or periods of development or decay. Its masses are merely formed and shaped by an aggregation of its molecules, and are broken down or disunited by the wear and attrition of its particles. The beginning as well as the termination of these masses is indeterminate, and is entirely under the controul of fortuitous circumstances. It merely possesses the property of being influenced by laws strictly physical and chemical, is endowed with no faculties, no excitability, and no powers of motility, except what are imparted to it by physical force, by the mutual attraction and repulsion of its particles, and which is in no wise indebted to, or connected with, any principle of life, or vital property.

Organized matter, on the contrary, has for its main object its individual preservation, and its propagation and extension. It derives its origin from a germ, which constituted a portion of a being altogether similar in form and attributes to itself; it forms, according to its necessities, the molecules which are subservient to its own preservation. It does not grow simply by external accretion, or aggregation, but by intussusception, or the interstitial deposition of molecules; its integrant parts are not every where identical, but are heterogeneous, and exhibit different characters in different situations—assume different forms, and are endowed with dissimilar properties. It is composed of solids and fluids, which exercise a correlative influence upon each other; is not merely endowed with properties, but with faculties, in virtue of which it is susceptible of being influenced by external agents, and excited to the performance of certain acts, the assemblage of which constitute what are called the vital phenomena, or life itself. It moves and feels, thinks and wills, is vigorous or feeble in its actions, according to the necessities inseparable from its preservation; passes through regular and determinate stadia of growth and decay, which are regulated by the same necessities; the period of its duration, though to a certain extent dependent upon fortuitous circumstances, is nevertheless controuled by determinate laws, and it does not come to its end by a mere mechanical wear and attrition of its particles, but by a series of changes dependent upon the nature of its own existence, by which its faculties become gradually impaired and disqualified for the performance of those actions the assemblage of which constitute life or vital phenomena; these finally cease, and it becomes still, motionless, senseless, and dead.

> "Solvuntur frigore membra;
> Vitaque cum gemitur fugit indignata sub umbras."

The process of decomposition commences; the characters of organized matter become merged in those which appertain to inorganic or brute masses—its particles are resolved to enter into new forms, and

> "Fit quoque, ut in nostrum quom venit denique cœlum,
> Corrumpat, reddatque sui simile, atque alienum."

The principle which impresses upon organized matter these distinguishing peculiarities, pervades all its forms, and identifies itself with all its gradations. Its actions are manifested throughout every form and variety of animal existence, from the lowest monad up to man, who presents the most complex and perfect organization in the whole scale of animal beings. It is the essence of the entire assemblage of actions which constitute life; is the source of all living entities, and fulfils all the numerous and varied operations which are called for by the exigencies inseparable from their origin, growth, preservation, and propagation. But what is "this fleeting and evanescent energy which, unseen by the eye, untracked by the understanding, is only known, like its great author, by its effects; but which, like him too, wherever it winds its career, is perpetually diffusing around it life and health, and harmony and happiness?"* This question, like the enigma ensculptured upon the Temple of Isis, has never been answered, and will, to the end of time, remain concealed within the impenetrable bosom of divinity: and Dr. Jackson, instead of entering into any useless speculations on the subject, very judiciously observes, that whether the aptitude, which it imparts to the organization to be impressed by stimuli,

> "Is a property matter acquires by its organization; or whether it proceeds from an immaterial or imponderable principle, acting through organized matter, is a question of metaphysics foreign to medicine—what we know as certain is, that organization and vitality are inseparable; they cannot exist in an isolated state. Of vitality we can form no conception, but as it is displayed in organized matter; and of organized or living matter, our knowledge is altogether derived from the vital phenomena it displays."

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* Good's Book of Nature.

But matter, endowed with this principle, and possessed of the "capacity or aptitude for vital phenomena," will remain quiescent, unless it be exposed to the influence of stimuli, which is an indispensable condition in their development. The seeds of a plant, though furnished with a germ perfect in its organization, and endowed with this essence of vitality, may be shut up in a box for months without manifesting the slightest indication of vital phenomena; but expose them to heat, moisture, and oxygen, which are their appropriate stimuli, and the infant germ will burst from its solitary incasement, will unfold its delicate foliage, and, nourished and sustained by congenial stimuli, will grow and flourish, and acquire all the characters of individuality, which appertained to the parent from whence it had its origin. The same is true of the eggs of oviparous animals: hence our author concludes, we think justly, with Brown, "that life is called into activity, and maintained by stimuli, or is the consequence of the operation of stimuli, or excitants, on organized matter."

All the causes which surround us and can be made to act upon our organization, however different in their nature, have the same general modes of action on the organized structures, "either exciting or diminishing the organic actions of the organ or organs receiving their impressions; they are either stimulants or sedatives." These agents, he conceives, have no other appreciable mode of action, and all the recognised physiological and pathological phenomena, as far as our researches can be carried, are explicable upon these acknowledged principles; their modifications and variety being merely dependant upon the difference of the structures concerned, and the degrees of intensity exhibited by the action of the efficient agent itself. When the impressions they occasion are moderate, they are exciters of healthy phenomena; when their intensity surpasses a certain limit, the impressions they excite are no longer consistent with the healthy play of the functions, and they become the causes of abnormal, perverted, or pathological phenomena; the one or the other of these conditions being excited by the same agents, according to their degrees of intensity. Dr. Jackson does not consider that specific modes of action are at all necessary, if they do exist, in explaining the phenomena of the animal economy in a natural condition, or that they can aid us in the adoption of practical means to combat them in a morbid state. In relation to his explanation of the excitation of the phenomena of life, by the action of stimuli upon the organization rendered susceptible by being endowed with the essence of vitality, we accord fully with our author, and believe the proposition to be incontrovertible; but in the conclusion which he has deduced from it relative to specific modes of action, we think he has adopted a postulate which is far from being compatible with the known phenomena of the healthy and diseased actions. That the element of all organic phenomena is either an impression of stimulation or counter-stimulation we are fully assured, but in the modes of these organic actions there are shades, and varieties, and modifications, and sequences, which cannot be explained upon any other known principle than the acknowledgment of specific actions, either in the tissue itself, or in the acting agents. We may be told that all this may be explained upon the appreciable variety of the structures which are implicated, but what is this but a tacit acknowledgment of the principle we are contending for; for if a structure, which is indebted for its capacity to act under the influence of stimuli to the same vital essence which also endows another structure with the same capacity to be excited by stimuli, and this structure evinces any peculiar mode of action not exhibited by the other, we maintain that it is capable of specific modes of action, inasmuch as every action peculiar to any structure or organ, and incompatible with the capabilities of another, must be admitted as a specific action. While, therefore, all organized structures possess, in common, a capability of being impressed by stimuli, each one has its peculiar and specific modes of action, which are indispensable in the performance of its healthy function, and which likewise reveals itself in its diseased phenomena.

The next subject that engages the attention of our author, is the definition and classification of the organized solids, the general healthy and diseased characters of which are succinctly, but clearly stated. The organic elements, consisting principally of gelatin, albumen, and fibrin, variously modified, and arranged into fibres and filaments, constitute the basis of the different tissues and organs. These tissues are computed by Dr. Jackson as follows:—"1. Cellular. 2. Vascular, (arteries, capillaries, veins, and lymphatics.) 3. Serous. 4. Fibrous. 5. Fibro-cartilaginous. 6. Cartilaginous. 7. Osseous. 8. Nervous. 9. Tegumentary. 10. Glandular. 11. Muscular."

It should be stated, however, that he does not conceive this arrangement to be strictly physiological, but merely adopts it because it is conducive to clearness and precision in the examination of pathological phenomena.

It is not our intention to furnish an exposition of the views and opinions of the author upon all of these structures, or to point out their properties, as many of them do not embrace any thing not comprised in the common treatises on general anatomy. Upon a few points, however, we shall bestow more attention, as the considerations they involve are of a more interesting character.

In reference to the capillary circulation, we meet with some views which, though they have been advanced by several distinguished physiologists, have never been generally adopted. That they should not have received a more general assent is to us surprising, since they are not only clearly established by an examination of the movement of the blood through a diaphanous structure, but seem to us to be indispensable, to enable us to comprehend many physiological and pathological phenomena. In relation to this subject, the following are the sentiments advanced:—

> "From the results of microscopical observations, little doubt rests on my mind, that a large proportion of what is regarded as capillary circulation, is not in fact performed by vessels. On the contrary, the blood circulates out of vessels, but in currents which are established in the globules and interstices of which the ultimate structure consists. While examining the circulation in diaphanous tissues, we have the ocular demonstration of this fact. The currents of globules flow in every direction; I have seen currents of globules commence where none existed, and by the application of a mechanical irritant, I have seen the whole tissue become a mass of moving globules, pursuing every course with great diversity in their velocity." p. 23.

The correctness of these observations are confirmed by the experiments of DUTROCHET on the circulation of the Salamander; and still more by those of SARLANDIERE and BROUSSAIS. But whether this circulation, beyond the pale of the capillary vessels, is effected by a simple percolation of the fluid through a kind of spongy parenchyma interposed between them, as represented by the ancients, and especially by ERASISTRATUS; through lateral pores, as maintained in modern times; or by its traversing the interstices of the rudimentary globules of the tissues, we will not take upon ourselves to decide; but certain it is, that it is by this portion of the circulation "that all the phenomena of nutrition, composition, and those of decomposition," are developed;* and this view of the subject is rendered still more plausible when we refer to the lower orders of animals, which are endowed with no vessels, and in which the whole process of nutrition is accomplished by imbibition, and the whole circulation by a simple percolation of the nutritive fluids between the homogeneous animal molecules.

But we must leave this subject to pass to the consideration of the nervous system, which, whether we consider the delicacy of its organization, its wide diffusion amongst the various tissues and organs, the varied functions to which it is subservient, its exquisite powers of perception, its extensive participation in both the animal and organic functions; or whether we look upon it as the seat of all our sensations and thoughts, the supreme regulator of all our volitions and our actions, or as the throne of intelligence, it must be admitted to possess a high and commanding claim upon our attention. Its operations blend themselves with all physiological and pathological phenomena, and the manifestations of its powers are developed in every act of the organization.

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* Broussais's Physiology, p. 351.

The nervous system is represented by Dr. Jackson as consisting of two principal divisions:—"1st. The brain, the spinal marrow, and their nerves; and 2d, the great sympathetic, or intercostal nerve, spread along the neck, in the chest, and abdomen."

1. *Cerebro-spinal System.*—This portion of the nervous system constitutes the means by which the external relations of the individual are preserved. It is at once the seat of intelligence, of volition, and of the expressions. The various nervous ramifications and expansions constitute, as it were, the outposts of the system; they receive all impressions, and like faithful sentinels, convey them to the brain, where they excite perceptions, and create volitions. They warn of the dangers which surround us; and return, from the brain to the locomotive apparatus, the power by which we are enabled to resist or escape them. They furnish a convenient avenue by which a never-ceasing tide of pleasures find an inroad to the mind, or through which sickness, pain, and misery, inflict upon our existence their pangs, and their withering influence: they depict the passions, and pourtray the emotions of the soul—whether illumined by joy, or distorted by sorrow and despair: they animate every impulse, regulate every motion, and experience alike every desire and every aversion: they, in fine, by their varied and elevated endowments, place man above all the beings which surround him, and constitute him the lord of creation.

It has been customary, until within a few years, to consider the central portion of the nervous system as an unit; but modern researches and experiments have demonstrated that it should rather be regarded as constituted of several distinct apparatus, which, although somewhat linked together in structure, and united by sympathies, subserve different purposes, and execute different offices. Thus, the brain, as a whole, forms the organ of intelligence and feeling; but how numerous are the characters of which these attributes are composed, and how varied their activity in different individuals, and in different temperaments? These varieties are always found to correspond with the cerebral development, to be influenced by cerebral activity, and to bear to these the relationship of cause and effect. All men have brains, and if the human mind were a unit, all men should have the same feelings, the same intellect, and the same propensities, only making allowance for difference of activity. Varieties, in these respects, would merely be accidental, and individuals of the most exalted and varied attainments, would be altogether indebted to fortuitous circumstances for their preëminence. This would be a perfect solecism; and until the metaphysicians shall adduce some more powerful arguments in favour of the principles they espouse, we shall be satisfied to adopt the principles of GALL, according to which, the mind is composed of a plurality of faculties, each of which has a distinct locality, or an appropriate organ in the brain. This view of the matter is taken by our author, and we fully concur with him in the declaration, that—

> "The seat of these faculties is difficult to assign with precision, but it can be affirmed beyond a doubt, that the nobler and higher faculties are located in the anterior and superior parts of the brain, while the secondary faculties have their residence in the posterior and inferior portions of the encephalic structure." p. 32.

There are not only different portions of the brain subservient to the performance of the different intellectual operations, but there are different sections of the cerebro-spinal apparatus to excite and regulate all the other functions of relation. This is not a mere gratuitous assumption, but a fact fairly deduced from experiments on the living organism. The experiments of SERRES, FLOURENS, ROLANDO, and others, have determined the portions of the cerebro-spinal apparatus in which many of these functions are located, but as it would take up more space than we can allow, we will merely observe that the functions of sensation, voluntary motion, and respiration, seem to be seated in the medulla oblongata, and the parts in its vicinity. The acts of progression are regulated by the cerebellum, while the faculty of associating the voluntary movements is situated in the tubercula quadrigemini.

The nervous chords are regarded by our author as "intermediate between the nervous *expansions* or *tissues* in the organs, that are the recipients of external impressions, and the cerebro-spinal organs to which they transmit those impressions." These nerves perform different offices, some of them being subservient to voluntary motion, some to sensation, while some merely preside over the acts of innervation, or the various organic actions and functions.

The periphery of the nervous system of relation is considered by Dr. Jackson to consist of "nervous expansions," or tissues, existing in, and entering into the composition of the organs; and these he conceives may exist independently of the brain and nerves. Exemplifications of these expansions are furnished by the retina, the papillary expansions of the lingual branch of the trigeminus, the auditory nerve, and in the nerves which are distributed to the cutaneous papillæ. But if it is the intention of Dr. Jackson to assume these expansions as a constant character of all the peripheric nervous terminations, we do not think the inference warranted by observation, though we are aware that the affirmation has been before made by many distinguished anatomists, especially by Reil, Prochaska, and Carlisle. Rudolphi[*] denies that the nerves terminate in this manner in the tissues, or by free extremities, as represented by Reil, but affirms that they branch out, and become inflected upon themselves, so as to form a delicate plexus, composed of numerous minute loops. This also accords with the observations of Provost and Dumas.[†]

But as far as function is concerned, this does not seem to be a matter of much consequence: for whether the periphery of the nervous system consists of expansions, as represented, or of the kind of termination described by Rudolphi, it is evident that different portions of it are endowed with different susceptibilities, which enable them to execute actions appropriate to the functions they have to perform. This Dr. Jackson ascribes to a mere difference of structure, but in many cases such differences are not appreciable, and we should rather be inclined to refer it in part to a difference of vital endowment, in virtue of which each portion possesses an aptitude to produce peculiar and constant results under the influence of its appropriate stimuli; and this we would allege as an argument in favour of the organization being endowed with specific powers, or modes of action.

The cerebro-spinal nerves are not the only portion of the nervous system which transmit their impressions to the encephalon. In consequence of the close connexion between it and the ganglionic nerves, it likewise receives the impressions developed in the apparatus of the organic functions, which, however, are frequently so obscure, in the healthy state, as not to occasion any consciousness, but which, in disease, play an important role in the propagation of many pathological phenomena.

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[*] Grundriss der Physiologie. Band. I. p. 95.

[†] Magendie's Journ. Tome III.

2. *Ganglionic System.*—This important division of the nervous system differs as much from the cerebro-spinal in its organization, as in the functions it performs. It presides over the whole of the internal, or organic functions, while the other maintains and regulates the external, or animal functions: the one controuls the apparatus by which the individual is preserved, and the species propagated, while the other constitutes the medium by which he holds converse with the world around him. Both, however, are so closely linked together, that the influence of the one is readily extended to the other. The following inferences are deduced by our author, from considerations based on anatomical structure, relative to the functions of the ganglionic system:—

> "*a.* It is not independent of the cerebro-spinal nervous system, but derives its nervous activity from its connexion with that system. *b.* It is connected throughout its whole extent by the numerous nervous filaments, passing from one ganglion to another, and uniting the different plexuses. *c.* The organs of the head, neck, thorax, and abdomen, with the genital organs, which receive nervous filaments from this system, are placed in communion of actions and impressions, which are transmitted from one to the other, and it is thus the principal instrument of the sympathies between those organs. *d.* Supplying the thoracic and abdominal viscera, and genital organs, with nerves, and communicating with the cerebro-spinal nervous system, it is the medium of communication between these organs and the nervous system of relation. *e.* Supplying the abdominal and thoracic viscera, and genital organs, with numerous nerves, this system must be the chief agent in maintaining the exercise of their functions. *f.* From the quantity of nerves it distributes to the arteries, the closeness with which their vessels are invested with those nervous filaments, and which are lost in their coats, it must exercise an active agency over the circulation, and in this manner influence the secretions and nutrition. *g.* The muscles that receive nervous filaments from this system, have this peculiarity, that they act without volition, or even consciousness. They must consequently receive the nervous stimulation for this purpose from the ganglionic system." p. 37.

An interrogation of physiological and pathological phenomena will furnish numerous exemplifications of these laws. Many of the organs, the actions of which are regulated by this system, are composed of muscular fibres, and require, in the exercise of their functions, muscular contraction. This contraction is, therefore, excited by the ganglionic nerves, which, having only a remote connexion with the great cerebro-spinal centre, merely act in obedience to the commands of the organic instincts, while they have the integrity of their powers preserved by their connexion with the brain and spinal marrow. The nature of the functions which they regulate, moreover, exact an arrangement of the kind in question; for those actions which are stimulated by the will are generally irregular, interrupted, oftentimes wild and tumultuous; do not maintain that character of stability and permanency required by the organic functions, and would, if extended directly to the apparatus by which these functions are performed, often give rise to alarming and destructive consequences.

> "Every attack of convulsions would prove fatal by the spasm that would be induced in the heart. In the moments of ennui, of depression and despair, to which the mind is subject when suffering under moral afflictions and calamities, self-destruction would have been the constant refuge of the wretched against the evils attached to our existence, had the action of the heart been subjected to the controul of the will, which could thus suspend its function, and occasion instant death." p. 38.

This is also the case with the function of respiration, which is so closely connected with life itself, that, like the action of the heart, it cannot be suspended even for a few minutes without occasioning death; and as the voluntary motions are all quiescent during sleep, are annihilated in a fit of apoplexy, are deranged and perverted in a thousand ways, by the formidable accidents to which we are constantly exposed; were the functions of circulation and respiration dependent upon the acts of volition, even the indulgence of sleep would bring with it a final extinction of our being. The muscles of respiration are, however, so far under the controul of the will, that they are submitted to occasional interrupted acts of the volition, as in speaking, singing, &c. But as the organic functions are regulated by the ganglionic nerves—

> "It appears that a part of the functions of this system, is to place at the command of the viscera, and the muscles it supplies with nerves, a stock of nervous power that is independent of volition, and exempted from the numerous sources of derangement that constantly occur in the nervous system of relation, or animal life." p. 39.

The ganglionic nerves are, indeed, the principal instruments of the instincts of organic life; for as they are extensively distributed to the lining membranes of all the organs by which the life of the individual is preserved, they experience the wants of the viscera, which are the proper organic instincts, and convey them to the cerebro-spinal apparatus, through the medium of their numerous connexions with that system; and this in its turn excites volitions, by which the instinct of respiration, the calls of hunger, of thirst, of urination, defecation, copulation, &c. &c. are immediately provided for, and means are secured for the maintenance of our existence. These instincts vary, however, in their intensity: circulation, and respiration, we have seen, cannot be suspended for more than a few moments, without occasioning death: the calls of hunger and thirst may be endured for a time, but after a while become so overwhelming as to be irresistible: the same is true of urination, defecation, and all the functions by which life is maintained: but the wants of copulation, being merely subservient to the propagation of the species, though oftentimes urgent, may be controlled, without endangering the well-being of the individual.

The sympathetic relations maintained by the ganglionic nerves, between the different apparatùs which appertain to the system of organic life, and between them and the nervous system of animal life, are particularly important, as enabling us to comprehend most pathological phenomena, and also as constituting the proper source of many of the most prominent characters of disease. These nerves are intimately connected with the cerebro-spinal apparatus, not only by the free anastomosis between the solar plexus and the pneumogastric, but also through the union of the whole extent of the thoracic and abdominal portion of the sympathetic with the intercostal nerves. Other connexions exist at different points, as for instance, in the head, the eye, and the back, in the organs of generation, in the nerves of the ganglionic system which are expanded upon the arteries, which penetrate the bones, and even extend their branches into the intimate molecules of our tissues. As, therefore, the ganglionic nerves are extensively distributed upon all the internal surfaces of relation, and more sparingly upon the external, any irritation applied to those surfaces is rapidly communicated to the different organs, which soon become implicated in the irregular or perverted actions which are thus developed. The stomach and duodenum being most richly endowed with these nerves, they thus constitute, as it were, a centre of sympathies, and any action excited in them irradiates in every direction, involving the organs more or less readily, according to the intimacy of their sympathetic relations. The heart, especially, is peculiarly prone to participate in any disturbance of this kind: its contractions become increased, the course of the blood becomes accelerated, the process of calorification is exalted, the respiratory apparatus also becomes disturbed and is rendered frequent and laborious; the brain is often involved in the irritation, giving rise to cephalitis, or arachnitis, apoplexy, epilepsy, hysteria, and even mania and hypochondriasis. The glandular apparatus may also share in the same surexcitation; they may have their substance inflamed, their secretions increased or diminished, and their whole functions disturbed and perverted; and in the members the same cause may give rise to muscular and articular pains, cramps, irregular contractions, and even tetanus. All this may arise too from a simple irritation commencing in the stomach and intestines. But it must not be inferred that an irritation commencing in another organ will not produce the same results: the course we have pointed out is the most usual, yet an irritation commencing in any other apparatus may have its influence extended directly to one or more of the organs or systems which have been enumerated, or be reflected into them by the cerebro-spinal nerves, and produce results altogether similar.

> "The heart, more than any other organ," observes Dr. Jackson, "experiences the agencies of the stomach. The irritations of the mucous membrane of the stomach, with few exceptions, are extended to the heart: its action becomes quickened, and febrile symptoms are induced. The same results may occur from the irritations of any of the other viscera, but it is less common with them than with the stomach; and in reality it will be most generally observed that when fever attends on the inflammations of other organs, the stomach has partaken of the morbid irritation. The general occurrence of these facts, at one time, induced M. Broussais to entertain the opinion and inculcate the doctrine, that irritation of the gastro-intestinal mucous tissue, was a necessary prelude to the establishment of fever, without which it was never manifested. This absolute generalization of facts, perfectly excusable from the frequency with which they are observed, was too hastily made; and in the manly and frank spirit of a true philosopher, has been amended upon mature observation and reflection." *p.* 41.

We have quoted this paragraph, not only with a view of illustrating our remarks, but also to correct an error which has been currently circulated in reference to the principles of M. Broussais, and those advocated by the individuals who have espoused the principles of physiological medicine. The *ontologists* have sought refuge under the misrepresentation thus busily circulated, and have availed themselves freely of the opportunity presented by this too hasty generalization of M. Broussais, to detract from the merit of principles which they found too solidly fixed upon the bases of induction to be assailed upon many other points.

But while the whole of the organs are linked together by means of the nervous system, in a chain of the most intimate sympathies, one organ may have its actions deranged while all the others continue to perform their functions in a healthful manner. One may be submitted to an inordinate degree of excitement, while another has its actions proportionally diminished, and it is by no means unusual to find a diseased process going forward in some one of the tissues or organs of sufficient intensity to occasion disorganization, while the others maintain the integrity of their functions, and take no participation in the disturbance.

The observations of our author on the tegumentary, glandular, and muscular tissues are highly interesting, but we shall be obliged to pass them over, and the next chapter, which is devoted to the consideration of the physiological and pathological state of the fluids, we regret cannot receive from us more attention. These subjects are handled with much ability, and the whole chapter abounds with reflections of an interesting nature.

Organic force, or irritability.—We have hitherto been engaged with the consideration of the properties or qualities of the living organism, the different modifications it presents, and the relations its different parts bear to each other. We must next take a cursory view of its forces, or the powers by which it receives its aptitude to be influenced by the agents which act upon it, and to manifest the various conditions called vital phenomena, the assemblage of which constitute what is properly called life. We allude to certain powers or forces, which superadded to the organism, imparts to it certain capacities or aptitudes, which form an indispensable condition of all organic actions, are necessary participants in all vital phenomena, and without which the parent germ could not grow, and be shaped into the regular and determinate forms which characterize a perfect being—could not appropriate to itself the nourishment necessary for its subsistence; could not maintain its relations with the world of pleasures around it, become a creature of reason and instincts, of volitions, desires, and aversions, or, in fine, be capable of communicating the essence of its individuality to be unfolded and developed into a being possessing physical and moral attributes similar to its own.

"The actions of living beings are not self-existing, or have a positive independence; they are effects. They depend on two circumstances or causes for their production. 1st. Organized matter, organs endowed with a force or aptitude to experience the impressions of exterior agents or influences. 2d. The actual impression of these exterior agents or influences." "Without organized matter and organs, there can be no manifestation of vitality; there can exist no vital phenomena. Without exterior influences, organized matter and the organs remain quiescent; they possess no positive activity; they cannot enter into action; no vital phenomena can be called into existence. The absence of either is fatal to vital activity; vital actions cease when either is withdrawn; they cannot commence or continue without the concurrent aid of both." *p.* 98.

The force or power from which organized matter receives these aptitudes, has been variously designated by different writers, and sentiments of the most discordant nature have been entertained with regard to its nature or characters. No correct view of the subject had been taken when Glisson first taught that all the organs are endowed with a property or force, which is an indispensable condition of all their movements and actions, and without which the functions would cease or could not be performed. To this force he applied the appellation of *irritability*, which is still employed to designate the power in question, but was hence very differently applied by different physiologists. The author just quoted divided irritability into natural, sensitive, and cerebral; the first manifested by direct irritation, the second by impressions made on the senses, and the third originating in the brain. The Glissonian doctrine was adopted by De Gorter, and subsequently extended by Haller, who restricted it to the phenomena of motion, or rather, in distinguishing it from sensibility, with which it had been before confounded, he made sensible contractions its proper test, and, therefore, restricted it very incorrectly to muscular fibre. Sensibility was also supposed to be a vital property, but, as our author correctly remarks, "sensibility is a function, the office of a particular apparatus of nervous organs, and not a vital property." It is by confounding the principles of irritability, which is a fundamental condition, with functions which are merely secondary phenomena, that most of the errors have originated which have been taught upon this subject. This observation not only applies to the doctrine of Haller, but also to that of Brown, who, in employing the term excitability, confounded irritability and sensibility, as the expression, in the acceptation in which he employs it, embraces both these principles. It should, on the contrary, be regarded "as an ultimate fact of the organization. It belongs to all organized matter whatever its form, state, or condition. It is inseparable from organization, and is the first element or essentiality in every act or phenomena of life. It is then a vital property, possessed by every organized being, enjoyed by every portion of the living animal and vegetable structure." But we are here met by a question of some moment, and to which it may be difficult to furnish a solution; what is the origin of the vital property? Is it a transmission with the rudimentary germ, from the parents to the offspring? Or is it acquired by the development of the organism? Does it increase with the evolution of its different parts, attain its full activity only when they have reached the acme of their formation, and decline in proportion as they become worn out, and evince a tendency to return to the condition of the elementary molecules by which they were built up and sustained? The first of these doctrines appears to us untenable; whether we adopt the philosophy of the spiritualists or the solidists, it is alike irreconcileable with the laws of strict induction.

"The germ does not possess the organs of the fœtus, or the fœtus those of the adult. How vast is the disproportion between the incipient germ and lordly man, the ponderous elephant, the unwieldly leviathan of the deep, and the gigantic oak, the monarch of the forest, which proceed from it. Can it be supposed that the organic force, which imparts to the organs their capacity for action exists before the organs are formed, or that in the *punctum saliens* is included the power that is destined to bestow the active energies, and maintain the phenomena of the immense mass of matter that composes its perfected and developed type? These are suppositions that would be wholly gratuitous, without fact or analogy in their support." *p.* 100.

This organic force must, therefore, be derived from the nutritive actions, and to insure its development it is only necessary to bring the germ, already quickened by the act of fecundation, in relation with its appropriate stimuli; it appropriates exterior matter to its wants, its rudimentary parts become by degress unfolded, its irritability multiplies in the same ratio with the development of the organization, is most active when the latter has attained its full and perfect development, and declines as it becomes altered and disintegrated by age.

> Præerea gigni pariter cum corpore, et una
> Crescere sentimus.—*Lucret.*

Adopting this view of the subject, we shall, without stopping to enter into any metaphysical disquisitions, proceed to lay down the principal laws of irritability, as deduced by Dr. Jackson from an observance of its phenomena.

" *First law.*—Irritability is a common property of all organized matter, and is a first result of the vital chemistry or affinity by which matter is brought into and maintained in an organized state. It is a property of the solids alone.

" *Second law.*—Irritability, though a common property of organized matter, yet being a result of organization, is modified by every difference of organization.

" *Third law.*—Irritability has its source in the system. It is constantly fluctuating, being greater or less in degree, either in the whole organism or in certain organs. It is dependent for its production on the activity of irritation, the quantity and state of the fluids, and the facility of their circulation.

" *Fourth law.*—The quantity of the fluid influences the production of irritability. It is always most active in the most vascular structures, and it never increases in a part without a corresponding increase of fluids in that part. Whenever the irritability is diminished, the fluids are uniformly in less quantity, wherever that diminution has occurred; and if the supply of the fluids be cut off, as in the operation for aneurism, the irritability, as well as sensibility, is reduced to the lowest ebb, and returns only as the circulation is restored.

" *Fifth law.*—In the exercise of irritability the state of the fluids has manifestly a marked influence. Black blood passing into one organ soon determines a suspension of its irritability, and consequently of its vitality. It acts in this manner on the brain, the heart, and other organs, when respiration is interrupted.

"*Sixth law.*—The facility of the circulation of the fluids is connected with the manifestation of irritability.

"*Seventh law.*—Irritability does not exist in an equal degree in all tissues and organs; and, consequently, they differ widely as to their susceptibility of receiving impressions.

"*Eighth law.*—The irritability being increased in one, two, or three, (it very rarely is in four,) organs or tissues, it is correspondingly diminished in all the other organs and tissues. The phenomena of disease constantly illustrate this law.

"*Ninth law.*—Within certain limits; irritability increases with excitement, or in proportion to the action of stimuli. It always diminishes by the abstraction of stimuli in the part whose organizations are *indirectly debilitated.*" *p.* 111, 113.

Functions.—The acts of the organization thus constituted and endowed, manifest certain phenomena which are called functions. These are necessary in the preservation of the individual, and in the propagation of the species. "Life is indeed maintained by the functions; they are, as Richerand expresses it, the means of existence; and every disorder of function, is an aggression on the province of life." *p.* 124.

The functions have been very differently enumerated by physiologists; but the following exposition of them by Dr. Jackson may be considered as embracing all the acts of the organization, which are properly entitled to that appellation:—

"1. Digestion. 2. Absorption. 3. Respiration. 4. Circulation. 5. Assimilation, or nutritions proper. 6. Calorification. 7. Secretions. 8. Innervation. 9. Sensibility, or sensations. 10. Intellectual and pathetic faculties. 11. Locomotion, or voluntary movements. 12. Expressions. 13. Generation."

These have been very appropriately divided into two classes; 1st, those which subserve the preservation of the life of the individual; 2d, those which are instrumental in the preservation of the species. The first class includes two orders of functions: 1, those of nutrition, as digestion, absorption, respiration, circulation, assimilation, secretions, calorification, innervation; 2, those of relation, as sensibility or sensations, the intellectual and pathetic or moral faculties, locomotion, and the expressions. The function which is subservient to the preservation of the species, is generation.

This enumeration, though not free from objections, is perhaps liable to as few as any other which has been proposed. Our author has assigned, as the essential characters of a function, two conditions: "1, that it performs a particular office in the economy; 2, that it has an organ, or an apparatus of organs, destined to its accomplishment." Now if this view be admitted, we cannot urge any very forcible objection to the specifications made, unless it be that in some of the functions enumerated, the same apparatus is made to subserve different purposes, as for instance the nerves, that of sensation and innervation, and the respiratory, assimilative, and secretory apparatûs, the functions which appertain to them properly, and also that of calorification.

The functions of relation display themselves in man in their greatest degree of perfection. They bring him, in common with animals, in relation with the universe which he inhabits; render him alive to its pleasures and its pains, and excite in him desires or aversions, according to the exigencies which provide for his support, his safety, and his enjoyments. But upon him alone do they impress the more ennobling characters of an intellectual and moral being, by which he is exalted far above all things of earth, and is alone, of all creation, rendered sensible of the existence and attributes of a Supreme Being, to whom he owes all things, and is responsible for all actions.

The apparatus by which he is enabled to exercise these important functions are, "the encephalon or brain, the medulla spinalis, the cerebro-spinal nerves, the nervous tissue or expansions in the organs, and the great sympathetic or ganglionic system."

These, as is very properly observed by the author, should be considered as a group of apparatus, differently organized at different points and having different actions appropriated to dissimilar functions. The gray and medullary structure, even, of which they are composed, perform different offices, and are varied in their relative positions to suit this purpose. In the cerebrum is placed the capacity or power of manifesting the intellectual and moral operations; the cerebellum probably regulates and coördinates the voluntary movements, while the medulla oblongata, including the tubercula quadrigemini, is the organ of the sensations, and the exciter of voluntary motions and the expressions, as well as respiration.

With regard to the relationship between the gray and medullary substance, Dr. Jackson does not agree with Gall, that the office of the former is to serve as a matrix or generator of the latter.

> "The relation pointed out between these two substances does not consist in a mere provision of gray substance that medullary substance may grow from it, but that different functions are to be performed, and, consequently, that a different structure is to be provided." *p.* 127.

In this sentiment we are disposed to concur; at least the hypothesis of Gall has never been satisfactorily established, and, as has been observed by Tiedemann, is incompatible with the order of the development of the organ. In addition to this, if the one were the matrix of the other, there should be a constant relationship between them, which an appeal to comparative anatomy will convince us is not the case. Thus, as has been justly observed by Treviranus,* if we compare the brain of a bird with that of man, we shall find in the first a large quantity of gray substance, in proportion to the quantity of medullary matter; while in the latter the medullary matter greatly preponderates. But be this as it may, the two substances do not possess the same vital properties; for the gray substance of the convolutions may be sliced away, in a living animal, without occasioning either pain, convulsions, or destruction of the powers of sensation or motion; but if the medullary portion be only slightly injured, the one or the other of these results constantly ensues, according to the part affected.

The medullary fibres are considered by Dr. Jackson to perform the office of conductors of the impressions or stimulations; while the gray substance, he thinks, composes the nervous organs which are engaged in "executing, manifesting, or originating the nervous functions, and displaying nervous phenomena."

The first part of the proposition, as far as it goes, is indisputable, but the latter is a mere assumption unsupported by positive testimony, and scarcely reconcilable with the structure of some portions of the nervous system, especially with the origin of some of the nerves; for, notwithstanding the affirmation of Gall, that they all proceed from the gray substance, the most careful researches have not yet been able to establish the truth of the declaration. Indeed, admitting it to be well-founded, the quantity of the gray matter in some portions of the nervous system, and especially as connected with the origin of some of the nerves, is too insignificant to perform the important offices assigned to it, and the medullary fibres vastly too great in number merely to serve as instruments of transmission.

"The sensations," says Dr. Jackson, "are the perception by the intellect or soul of impressions or movements in the organs." Thus, when an impression is made upon any of the surfaces of relation, it is not perceived by the nerve which receives it, but is transmitted by it to the brain, where it excites perception and awakens volition. The nerve, therefore, under these circumstances, performs a double office; it acts as a recipient of the impression, and as a conductor by which it is transmitted to the sensorium. It is by the nerve, also, that the volition is conveyed to the particular muscles which are to be called into action. The truth of this proposition is easily demon-

* Biologie, Band 5. p. 322.

strated. If the nerve be divided or included in a ligature, the impression is not perceived; and the same effect takes place when the brain, from disease, is incapable of exercising its functions in a proper manner. Yet there are perceptions which take place independently of immediate external impressions, and which originate in the brain itself, as for example, those which are excited in dreams, delirium, &c.

The sensations have been divided into general and specific, the first consisting of the common feelings developed by the nervous system in general, *(sensatio aesthesis,)* the second those which are developed by special apparatus, and excited by special impressions, as touch, smell, taste, hearing, and sight. This division is well founded in nature, and should be observed in enumerating the phenomena of the functions of sensation.

It has been already stated that sensation should be considered as a function, and not as a vital property, as has been represented by several authors. It must not, therefore, be confounded with irritability or excitability, as has been done by some physiologists. The one is a property appertaining exclusively to the nerves, and is enfeebled or annihilated by any disease or injury implicating their structure. The other is a property of the entire organization, and is an element in all vital phenomena. But although sensation is a property which belongs to the whole nervous apparatus, it is greatly modified in different parts of it; in some merely manifesting itself in form of general sensations or feelings, as of heat, of cold, of pleasure or pain, titillation, itching, &c. while the other exhibits special characters, as in the sensation of sight, smell, &c. and can only be excited by peculiar stimulus, as light, odoriferous matters, &c. The encephalon does not always evince the same aptitude to receive the impressions conveyed to it by the nerves. The readiness with which it perceives them being not only influenced by different states of health and disease, by the different degrees of intensity presented by the impressions themselves, but also by its various states of action or repose; an active state of abstraction frequently rendering it insensible of impressions of even considerable intensity. When the energies of the brain become exhausted from long-continued or active employment, or from disease or injury, perception frequently does not take place, although the nerves may be exposed to strong impressions. It is in virtue of this law, that pain is extinguished by narcotics, and that an intense irritation may exist in some parts of the organization, without there being any absolute perception of pain. If, moreover, the nervous organism be simultaneously exposed to two impressions of unequal force, the perception of the more intense is only manifested. Thus, observes our author, "persons labouring under acute gastritis, or other intense internal inflammations, become insensible to tickling, though extremely sensitive to it in health."

The sensations seem to have a close relation with the circulation, increase of one being attended with an augmented flow of blood to the part; they are enfeebled and exhausted by intense application, but are rendered more exquisite by moderate exercise, and are on the other hand blunted by long-continued repose. From excessive employment they may, moreover become extinct, or acquire abnormal characters. The abolition or loss of one sense is compensated for by an increase of activity in some other; and the activity of sensation in general is in an inverse ratio with that of voluntary motion. Females and children are endowed with the most exquisite sensibility. Every sensation is attended with pleasure or pain, desire or aversion, and the one or the other of these feelings is developed, according to the intensity of the impression.

> "Pleasurable sensation is a moderate and regular exercise or excitation of sensibility, by an object adapted to the organ of sense on which its impression is made." "Painful sensations are caused by an excessive or irregular action of sensibility, or its too great excitement by objects having relations to the organs of the senses, but acting with too much energy; or by objects that have no relation to the functions of the organs of the senses, and are detrimental to their functional acts by irritating them unnaturally."

Pleasure and pain are, therefore, merely relative conditions, and pass into each other, are excited by the same kind of impressions, only differing in degree, the commencement of pain being the termination of pleasure. Thus, "gentle titillation is a sensation that might merit, far beyond scratching, the appellation of a 'royal pleasure,' yet when pushed to excess in tickling, not only is it painful, but may even excite convulsions. Pain is the morbid state of pleasure." *p.* 141.

The perception of all impressions is attended with cerebral excitement proportionate to their intensity, and when this excitement is immoderate, it not only constitutes disease in the brain, but is also reflected into the whole of the organism, and may give rise to a morbid condition in one or more of the organs. Impressions are thus diffused throughout the system by sympathy, and occasion a concatenation of pleasurable or painful sensations, according to their force.

The next subject of consideration with our author is the sensation of touch. It will be unnecessary to follow him closely in his observations upon this subject, as he only gives it a very cursory consideration. He has, however, corrected an opinion advanced by Broussais, "that the sensations are not judged by the centre of perception alone, and *à priori;* but after this latter has reflected them to the sensible parts of the system, and particularly to the viscera."* The participation or rather the modification of tactile sensations by the viscera, Dr. Jackson conceives may be more readily explained upon the supposition, "that the morbid irritations of the latter are conveyed to the brain, which being sympathetically disordered, the mode of sensibility is changed; it can no longer respond in a natural manner to healthy and natural impressions, and the perversion and vitiation of the sensations result from the unnatural position of the central organs of the sensations, the integrity of which is essential to natural and regular phenomena." *p.* 145.

According to the hypothesis of Broussais, even the specific sensations, as those of smell, taste, sight, hearing, &c. could only be manifested after the impressions by which they are excited have been submitted to the circuitous process of being reflected to the epigastric centre, and from thence back upon the brain The impressions occasioned by the rays of light, by odours of various kinds, sounds, sapid bodies, &c. would thus have to undergo this double process of reflection, before they could be perceived in their proper characters by the brain, or, in other words, excite their appropriate sensations; a conclusion which can scarcely be reconciled with the phenomena of their functions.

We shall pass over the observations of the author on the sense of smell and taste, which, though judicious, do not present any thing to claim our particular attention; and in relation to the sensation of hearing, we shall only quote the following facts, to show the influence it is capable of exercising over the "moral and pathetic faculties."

> "I once witnessed," observes Dr. Jackson, "in a patient in the Pennsylvania Hospital, subject to paroxysms of mania, and who had been a military officer, a violent attack brought on while walking calmly in the yard, by the sound of a trumpet, which was blown as a troop of horse was passing. He seized a stick, addressed a tree as Napoleon, and commenced a furious assault."
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> "Plaintive and melodious sounds are tranquillizing, and often allay nervous irritation. I attended a gentleman from Virginia, who was an amateur of music, and a very fine performer on the flute, in an attack of pneumonia. Being absent from home, he became very much depressed in spirits during his convalescence, and his nervous system was exceedingly irritable, particularly in the

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* Physiology, p. 47.

night, when he was restless, and could not sleep. I became apprehensive of nostalgia. While in this state, some pleasing melodies were accidentally performed under his window on a hand-organ, with which he was much delighted. His mind was immediately composed, and he engaged the man to continue his performance; he obtained a quiet night with comfortable sleep. He repeated the experiment with a similar result, and soon recovered." p. 154.

But we must now pass with our author from the investigation of the functions of the senses, to the examination of higher powers—the consideration of the intellectual and moral faculties, by which man is distinguished from all the inhabitants of earth, and ennobled and exalted to that state of preëminence in the scale of existence which has been awarded to him alone by the wisdom of his Creator. To the brute is granted no higher destinies than to be the mere creature of gross instincts; and the main spirit of all its actions acknowledges no higher object than the mere gratification of instinctive or corporeal wants. These gratified, its existence is for the most part restricted to the operations of vegetative life, until again roused by the calls of hunger, or stimulated to the defence of its safety. It is a stranger to all rational endowments, is insensible to the refined impulses of all rational pleasures, and its relations with the world around it, are but slightly elevated above those of the mere vegetable creation. True, it feels, and wills, and has a locomotive apparatus, but these attributes have no higher object than the mere gratification of the instinctive wants, which are inseparable from its existence; involve no higher responsibility than its immediate salvation; do not extend beyond the influence of the instincts by which they are prompted; are not animated by any intellectual power which looks for a renovated existence in another world; and know nothing of the refined attributes which characterize an intellectual and moral being. These high powers belong to man alone, and the Almighty Creator, in his infinite wisdom, has bestowed on no other being those high intellectual and moral attributes which renders him a responsible agent; which fires him with the desire of a knowledge of all that is in heaven and earth, and soothes him with the confidence of an extension of his intelligence, and an acquisition of an existence and of pleasures that can never die, in the world to come.

These high distinctive characteristics consist of two orders of faculties—

"The intellectual and affective or moral; or those of mind, and as they are commonly called, those of the heart. By the first of these, or the intellectual faculties, ideas are formed, knowledge is acquired and perfected, and man is endowed with the character of rationality; by the last, or affective faculties, he is invested with passions, the springs and impulses of his moral acts, and which, under the discipline of a well-ordered intellect, or the regular controul of the organs, elevate him to the sublimity of virtue, or degrade him to the baseness of brutal nature." p. 178.

But while these principles are acknowledged, we are met with a difficulty, in the progress of our investigation of the powers they involve, which the ingenuity of man has never been able to surmount, and the solution of which is entirely beyond the humble and limited sphere of his comprehension. What is mind? Is it an immortal spirit, or essence, which exists from time to eternity, pervades all space, animates all matter, and which is at the same time independent of all corporeal forms? or shall we be obliged to regard it in the more humble and perishable aspect of a mere appanage of organization? At this latter conclusion the mind revolts; and before it all our high-wrought hopes of a future and better state of existence, would be withered. It is inconsistent with the attributes of the Deity, and the principles of revealed religion, and cannot be sustained by any process of reasoning. Neither can the former hypothesis be reconciled with what is known of the manifestations of mind. Adopting, therefore, the sentiment of the refined SENECA, that it is one of the mysteries which, reducta et in interiore sacrario clausa sunt, we shall leave the question where we found it, and content ourselves with observing what is incontestible; that mind can only be manifested through matter, and that the brain is the organ by which all its phenomena are displayed. What the nature of the powers may be, which endow this portion of the organism with such important faculties, is foreign to the objects of the physiologist, to whom it is sufficient to attend to the manifestations of mind, and the general phenomena exhibited by the intellectual and moral faculties. The essence of mind itself must always remain, as it has ever been, one of the *res ardua et inextricata*, and any inquiries directed, with a view to determine a question so far beyond the powers of human comprehension, cannot fail to involve us in a labyrinth of the most fruitless and visionary speculations.

Assuming, then, that the brain is the organ of the intellectual and moral faculties, Dr. Jackson presents the following arguments in favour of that opinion:—

"1. The sensations, which are truly a part of the intellectual phenomena, for they communicate the impressions that form ideas, are the actions of particular organs, and have an apparatus of organs destined to their accomplishment. The intellectual and moral faculties are phenomena of the same order, and, it is a fair conclusion, require a similar mode of development and exercise —that is, by particular organs.

"2. All vital actions emanate from material organs, without which they can have, for us at least, no appreciable or known mode of existence. But the intellectual and moral faculties are only forms of vital action; they are not more wonderful or recondite in their nature, than most of the other vital phenomena, and if material organs are essential for the production of the one, it is a direct inference, they are not less essential for that of the other.

"3. The causes that influence the condition of the organs, affect the exercise or condition of the intellectual and moral faculties. Thus, food, drink, the weather, medicinal and morbific agents, frequently produce the most profound alterations in the state of these faculties, &c.

"4. The psycology, or intellectual and moral endowments of an individual, are not uniform in the different periods of life, in the different states of health and disease, of sleeping and waking; and these differences are invariably concomitant with particular conditions of the organs." p. 185.

Illustrations of these propositions might be furnished in great number, and by fair induction, from both physiological and pathological actions; but the principles they embrace are so self-evident, that we should deem it an act of supererogation to dwell upon the subject.

The next subject we shall notice, in connexion with the intellectual and moral faculties, is the question whether mind should be regarded as a unit, or composed of a single primitive faculty, as maintained by LOCKE, CONDILLAC, DESTUET TRACY; composed of a multiplicity of faculties, as maintained by KANT; or of the latter, each having a distinct and determined locality in the brain, as affirmed by GALL and SPURZHEIM. We cannot enter into the arguments by which the partizans of these several opinions have endeavoured to support their conclusions, nor do we conceive this necessary, as there are probably few philosophers of the present day who are conversant with the subject, and who are not convinced that the phenomena of mind are not of necessity manifested by a plurality of faculties. That these faculties, also, have special localities in the brain, is, we think, also fully demonstrated by a mass of facts, which no powers of sophistry can controvert. Many of these arguments are advanced by our author. In the execution of all functions, several acts concur in the completion of the process. This is manifested in the function of digestion, circulation, &c. The organs of the senses are separate, and each one executes its own peculiar mode of sensation, and as all our ideas are developed by impressions communicated to the brain by the senses, there must be a diversity, and consequently a certain independence in the modes of perception exercised by the different recipients of these sensations. The structure of the brain, too, is exceedingly complicate, which would not be necessary for the exercise of a single primitive operation; and experiments on this structure have, besides, demonstrated, that different portions of it have a constant correlation with certain faculties. That in proportion as a given portion of the organ is developed, so is its correspondent faculty; that whatever injures a portion of the brain, injures or annihilates the faculty located in it. In animals, the same principles hold good to the full extent, and explain the difference of feelings, of habits, and other attributes by which they are characterized. The faculties are not simultaneously unfolded; nor do the different portions of the cerebral mass reach their perfect development at the same period. A correspondence is observed in the appearance of the intellectual and moral faculties. All men do not exhibit the same characters, which they should, making allowance for difference in degree, if the human mind were a unit. A full development, no matter in what direction, should be sufficient to constitute the most varied and exalted intellectual attainments. Man would be capable of the most preëminent attainments in every department: in philosophy and in music; in poetry and in metaphysics; in mathematics; in the fine arts; in mechanics, and in buffoonery. When the mind has been wearied by intense application, it should, according to the hypothesis of the metaphysicians, be incapable of further achievements, until recuperated by repose—yet it is well known, that when thus fatigued, it is only necessary to change the object upon which it has been applied, and it will still be capable of acting with energy upon other objects. The whole phenomena, moreover, of mental pathology, furnish a mass of evidence upon this point, too powerful and conclusive to admit of a doubt about the plurality of faculties, and the constant relation between them and the cerebral development. In his conclusions on this subject, we fully concur with Dr. Jackson—

> "That the phrenological system of Gall and Spurzheim, in the designation of the faculties, and their classification, is absolutely freed from errors, will not be contended for, but its general truth and conformity with sound observation, will not admit of refutation or denial. It may be susceptible of improvements and of additions, but its fundamental propositions are founded in nature." p. 215.

The observations which we have thus far made, apply, for the most part, to the intellectual faculties. It yet remains for us to take a hasty glance at the affective or moral faculties, which are examined somewhat in detail by our author. He divides them into two orders: 1. Propensities, that direct to the moral and social actions founded in the interests of the individual, and in which self is the predominant feeling. 2. Sentiments, by which are dictated the acts that affect the interests and actions of the beings by whom we are surrounded, and with whom we are destined to hold an intimate correspondence.

Much difference of opinion has existed in reference to the sources and characters of the sentiments which constitute these two divisions of the moral faculties. Those who have examined the subject in its most abstract relations, amongst whom our author mentions La Rochefoucault, Voltaire, and Volney, have represented them as all springing from a single primordiate principle of self-love; have ascribed all our moral actions to desire or aversion. Such a view is, however, untenable; for if the leading phenomena of our moral sentiments be carefully analyzed, it will be found that many of them cannot be traced to such a source. This explanation, it is true, might enable us to explain the sentiment of self-love, of attachment, and some others, but can we, on the same principle, comprehend the combative propensities of certain individuals, the firmness of others, the sources of a pure unsophisticated benevolence, of veneration, of a desire to acquire, so strong in some instances as to prompt to the most daring thefts; of a penchant to destruction, which, in some individuals, breaks through all bounds—impels the son to embrue his hand in the blood of a father or brother, and oftentimes for no desire of gain, no principle of antipathy or revenge: surely no sentiment of self-love can be recognised as the primordiate element of actions such as these.

The ancients, and especially the Platonists, made a nearer advance to truth, when they regarded the moral faculties as having a connexion with the organization, and located them in the abdominal and thoracic viscera; for these organs are unquestionably materially disturbed by many of these sentiments, and especially the passions. This doctrine has been revived, in various forms, by many distinguished modern authorities; amongst whom our author enumerates Bordieu, Buffon, Bichat, Reil, Cabanis, and Broussais. The latter, however, while he adopts this hypothesis to a certain extent, blends with it the doctrine of Gall, and the phrenologists, who maintain that the moral faculties are seated in the brain, and that each faculty has its distinct and appropriate organ. "Our passions and our affections," says M. Broussais, "are a result of our intellectual operations; but the following are, according to my views of the subject, the conditions necessary for their existence. The passions cannot exist without a number of sensations referable to the viscera; and all these sensations are founded on our wants, or our instincts."—Physiology, p. 3.

This view of the subject is, we think, singularly confused, and results clearly from the distinguished physiologist in question having mistaken a part of the exciters of the passions for the faculty itself.

At one time he tells us the cerebral mass is the seat of the intellectual and moral faculties, and at the next moment that the viscera are also, to a certain extent, the seat of the latter. This cannot be. The viscera, or rather the ganglionic nerves, we have already seen, have an intimate relation with our instincts, and that the latter are instrumental in transmitting the wants of the viscera to the cerebro-spinal apparatus. As, therefore, one class of our moral or affective feelings, as already defined, are founded upon the interests of self, and as the instincts are the prompters to many sources of self-gratification, they, or in other words, the organs which are their seat, merely become the animaters of the corresponding faculties, or feelings, which, like the intellectual operations, can only be manifested by the brain.

But although the excitants of the feelings of this class are the instincts, or the internal sensations, the viscera are influenced in a different manner by some of the sentiments which belong to the moral or affective faculties. This is especially the case with that class of them which, from their intensity, merit the appellation of passions. The development of these is always attended with a vivid and inordinate excitement of the portion of the cerebral mass which constitutes the proper seat of the moral faculties; and as the nervous system, of which it constitutes the great centre, is extensively diffused amongst the different organs and tissues, it necessarily follows, that impressions made upon it, especially when intense, must be equally diffused amongst the organs, invigorating, retarding, or deranging their functions, and sometimes overwhelming them in a general torrent of impetuosity. This is precisely what takes place in the passions: the disturbance of the abdominal and thoracic organs is secondary, or consequential, on inordinate cerebral excitement, and does not take place, of necessity, as represented by Broussais, before the affective faculty can be displayed by the brain.

We think Dr. Jackson perfectly justifiable in his objections to the hypothesis of the distinguished physiologist just mentioned, and we cannot better give his views, and our own, relative to the point at issue, than by quoting the three following corollaries.

"For the production of the passions, or the action of the affective faculties, is required the concurrence, 1. Of special innate organs arranged in the cerebral structure; 2. Of particular impressions or irritations on the surface of the internal and external senses, and sometimes the action of other intellectual or moral faculties; 3. Of the perception of these impressions, or their repetition in the especial cerebral organs, appropriated to a moral faculty, and to which they have a relation; or the recurrence of these impressions by memory. When these circumstances are united, the affective or moral faculties are brought into exercise, the character of which will correspond to the kind of impression made; or ideas recalled; and the particular organ or faculty to which these bear a relation, and which they uniformly excite to action." p. 230.

The views of the intellectual and moral faculties which have been advanced, prepare us for the study of their pathological states; and an application of them to pathology will convince us that mental diseases are founded upon the same causes, are influenced by the same laws, and are to be treated upon the same general principles as the diseases which affect other portions of the organism. Much had been done by Gall and Spurzheim to establish this branch of pathology upon correct principles. But Broussais has more clearly defined its laws than had been done by any preceding writer. The principles inculcated by our author are very similar to those advanced by M. Broussais, and the able manner in which he has considered the subject, cannot fail to contribute to the elucidation of a part of pathology which has been for so many centuries misunderstood. We regret that we cannot follow him through the discussion of the subject; as the section of his work devoted to its consideration, abounds with sound principles and judicious reflexions. We may, however, state in general terms, that the healthy phenomena of mind being dependant upon the healthy state of the cerebral organism, so its diseased manifestations are likewise connected with, or dependant on, a morbid state of the same organism. Irritation, under its various shades and modifications, is the immediate condition, and its excess in one or more organ, and its deficiency in others, its reflection into different portions of the organism, &c. furnish an explication of the various characters of mental diseases.

In his exposition of the seat of the irritation in mental alienations, we find the author again advancing the supposition to which we have already objected: that the mental faculties and sensations are seated in the cortical or ash portion of the cerebral mass. Did our limits admit, we could, we think, adduce many considerations to invalidate such a conclusion, and feel assured that it can neither be substantiated by the physiological or pathological states of the organ or its functions, by vivisections, or any other source of accurate observation. Indeed, the author himself advances the hypothesis doubtingly, or rather in the shape of a probability.

We shall here be obliged to pass over the whole of the chapter devoted to the consideration of the voluntary movements, as well as those on the expressions, and on sleep and dreams. We will merely observe that these topics are discussed with considerable ability, and that the subjects they involve are illustrated by many judicious reflexions. The space allotted to them, however, is too small to allow of their being treated in any other than a brief manner.

This brings us to the second part of the book, which as already stated, treats of the organic functions.

That which first strikes our attention is the function of digestion. By this, man, as well as all animals, are enabled to appropriate to their wants the various aliments which a bountiful Providence has spread before them, and prepare, by an appropriate elaboration, the nutritious molecules which they contain for the sustenance of the organization. The organs by which this high purpose is accomplished, are exceedingly diverse in their characters, according to the nature of the animal, and the kind of food on which it subsists. In the monads and polypi, the food is introduced merely by imbibition, but as we ascend in the scale of animal creation, we find the apparatus becoming more and more complex, always, however, bearing a strict relation to the kind of food upon which the animal subsists. Aliments derived from the vegetable kingdom being more difficult of digestion than that furnished by animals, a more complicated apparatus is necessary for its solution than is required for the digestion of animal food; and this is not the only peculiarity; for however perfect and complicated the apparatus, the animals endowed with it are only capable of digesting that kind of food upon which they have been destined to subsist, and herbivorous animals cannot digest animal food, or those which are nourished by animal food, vegetable substances; yet some, as man for instance, has been more favoured by Providence, and as his wants are more numerous, and his appetites more diversified, he is endowed with the power of subsisting on both vegetable and animal aliments.

We shall not follow our author through his exposition of the different portions of the digestive apparatus, but the following paragraph in relation to the physiological and pathological relations of the liver, contains sentiments so similar to those we have been led from our own observations and reflexions to adopt, that we hope we may be excused for quoting it.

"The situation of the liver," observes Dr. Jackson, "abstracts it from the direct impressions of most of the exciting agents of irritative actions in our organs. Its diseases are for the most part secondarily induced, either by sympathetic irradiations from other organs, or by disturbance in its functional offices. The stomach, duodenum and liver are most intimately associated through the cœliac, hepatic, and solar plexuses of the ganglionic nerves, and their functions are directly concatenated. It is through the stomach and duodenum, the viscera directly and almost constantly exposed to aggressive impressions, that morbid irritations reach the liver. Most of the symptoms usually ascribed by systematic writers to diseases of the liver, belong, in fact, to chronic gastritis, and to acute and chronic duodenitis, while some proceed from chronic colitis. The phenomena of these various affections are all grouped indiscriminately together as symptoms of either acute or chronic hepatitis. To this cause is to be attributed the erroneous diagnosis of the medical attendants of Napoleon, from Dr. O'Meara to Antommarchi, all of whom mistook the clearest signs of chronic gastritis, for hepatitis, and advised for the illustrious captive an incompatible treatment, which his good sense resisted and induced him to reject. The first lesson I acquired, in prosecuting pathological autopsy in the Alms-house Infirmary, was, that in very few cases, supposed from their symptoms to be hepatic disease, was the liver in the least affected; while chronic disease of the liver was detected, where none of the signs, commonly considered as characteristic of it, had existed. In not a third of the cases regarded as of hepatic origin, is the liver in the slightest degree concerned, and when it does become involved, it is only consecutively to a gastritis or a duodenitis that have been its precursors, in the majority of instances, from sympathetic irradiation. The continuity of the gastric and duodenal mucous tissue, into the interior of the liver, is another cause of the propagation of the irritation of the two first organs into the liver, but is a less frequent source of its irritations than sympathy." p. 341.

As regards the process of digestion, it is of a complicated nature, and is only accomplished by the concurrent operation of a number of organs. The food taken into the mouth is masticated, or finely triturated, by the action of the teeth and jaws. During this act it becomes saturated with the saliva, and in that state is forced into the stomach by the act of deglutition. It is here submitted to several changes, the assemblage of which constitute what is called the process of chymification, by which it is converted into a soft pultaceous mass, in which state it passes into the duodenum to undergo changes still more important.

The precise manner in which these changes are effected, is difficult to determine. Upon some points, however, our information is of a more definite character. The presence of the food in the stomach is always productive of an excitement of the lining membrane of the organ; its circulation is invigorated, and its secretions are augmented. The fibres of the stomach being moreover irritated, it is excited to increased contractions, and by these the alimentary mass is submitted to a constant change of position, becomes thoroughly blended with the gastric secretions; has its cohesive powers diminished, and is finally converted into a soft, pultaceous, homogeneous mass of a grayish appearance, and a sweetish, subacid taste, called chyme. But what are the changes which are produced in the alimentary molecules during the process? and what the agents which are instrumental in giving rise to them? Upon this point the most diverse and contradictory opinions have been advanced; some referring it to a mechanical trituration, effected by the coats of the stomach, some to a process of fermentation, some to putrefaction and maceration, while others have attributed it to a process of solution, accomplished by the agency of a peculiar secretion poured out by the stomach, which has been called gastric juice. It will be impossible for us to discuss all these different opinions; nor will it be necessary for us to do so, since many of them are so palpably untenable, as to deserve no serious consideration; while others, though applicable to the process of digestion, as it takes place in certain animals, have little instrumentality in that process in man. Mechanical trituration, doubtless, has much to do with the function of digestion in the gallinacea, yet in the higher orders of animals, the arrangement of the stomach is such as to be incompatible with such an agency.

A much more plausible hypothesis is that which attributes the solution of the alimentary mass to the agency of the solvent powers of the gastric juice. Yet it is extremely questionable if this fluid really exists in the stomach, under the characters represented by Spallanzani, and admitted by most succeeding physiologists. That a fluid is secreted by the coats of the stomach, capable of exercising a considerable solvent influence upon the alimentary mass, is incontrovertible, yet that it is a special fluid possessed of certain specific chemical properties, is neither proved by experiment nor observation. That such is not the case, has been satisfactorily proved, we think, by the researches of Montegre and others, and until the converse of the proposition is sustained by more powerful facts than any yet advanced, we shall, with our author, admit the theory of Spallanzani somewhat doubtingly.

"I obtained," says Dr. Jackson, "a portion of the contents of the fourth stomach of an ox. After standing a short period, it separated into a supernatant turbid liquid, and a feculence. This last was composed of two parts, the first, occupying the surface, was a fine pulp of a dull green hue, and the other, which occupied the bottom, was the insoluble fibres of the hay and straw that had been the food of the animal.

"When the supernatant liquid was examined by Jones's improved microscope, it exhibited numerous minute flattened globules; these were transparent, but had the appearance of a dark opaque rim, caused, however, by the refraction of the rays of light. Floating in this liquid, were also small masses of an irregular shape, and semi-transparent, resembling gelatine. The fine pulp, when inspected by the same instrument, exhibited an infinitely greater number of the above described globules, and a much larger quantity of the semi-transparent gelatinous matter; it appeared to be composed almost entirely of them, mixed with a fine vegetable fibre. These globules are similar in their general appearance to those that proceed from animal food, excepting their size; it is much smaller." *p.* 352.

The chymous mass, taken from the pyloric extremity of the stomach of a dog, presented a similar appearance, except that the globules were much larger.

From all his observations, our author concludes, that maceration and solution are the principal immediate conditions of chymification. But to render these effective, the mass must be agitated by the peristole of the stomach.

The next step in the process is that of chylification. The changes by which this is accomplished are not less difficult of comprehension, than those which take place in the process just examined. What is certainly known on this subject is, that the chyme, after it enters the duodenum, combines with the biliary and pancreatic secretions, which produce some important changes in both its physical and chemical properties. What the precise nature of these changes may be, we are unable to determine. Various conjectures have been advanced on the subject, but none of them are satisfactory, and cannot be received in any other light than mere hypothesis. Dr. Jackson supposes the bile has some agency in separating the nutritious elements of the alimentary mass, in the form of chyle, or the elements of chyle, from the innutritive matters composing the feces.

> "The general character of bile," he observes, "is alkaline, and it possesses a strong affinity for oxygen. In the stomachical digestion, acids are developed, and the aliment, it would appear, acquires oxygen, as amidou is converted in the stomach into sugar and gum. Chemists accomplish this same result by various processes, all which increase the proportion of oxygen in the amidou. In the second, or duodenal digestion, by the operation of the bile, a reverse action is effected. The acids are neutralized, and the tendency to the oxygenation of the aliment is arrested: it is even probable some portion may be deoxygenated. The acids of the chyme not only combine with the alkaline salts, but precipitate the colouring principle of the bile, the picromel, cholesterine, its resin, and its mucus, which are rejected as excremental. What other changes ensue, it is not easy to determine. In addition to the chemical actions between the bile and the chyme, the biliary fluid stimulates the mucous tissue of the intestines, increases the secretion of the intestinal fluids, and excites the peristaltic movements of the bowels, procuring their regular evacuation." *p. 358.*

We can only state in reference to these conjectures, that further researches are necessary to confirm the correctness of the conclusions which they involve.

The elements of the chyle being thus separated from the excrementitious mass, are taken up by the lacteal vessels, are conveyed through the mesenteric glands, being in their course more highly elaborated, and are finally poured by the thoracic duct into the tide of the circulation.

The feculent portion of the aliment, mingled with the various secretions, is propelled along the course of the intestines by their peristaltic action; is gradually deprived of its thinner particles, and is finally expelled in form of feces.

The pathological states of the digestive function are so numerous that we cannot even enter into an enumeration of them. Some of the more prominent are detailed by the author, but an exposition of their characters can only be fully made in connexion with the subject of pathology.

The next subject which presents itself, is the function of absorption. But as our readers having already had an opportunity of becoming acquainted with the views of the author on that topic from a preceding number of our Journal, we shall pass it over in silence. We must plead the same excuse for not noticing the sections devoted to the consideration of "*the pulse and its modifications*," and "the pathological or abnormal states of the circulation," the substance of which has been already published in this Journal. The chapters on the circulatory, respiratory, nutritive, and secretory functions deserve from us a more particular attention, the more especially as the various topics which they embrace, have been treated of, in an able manner, by the author. We shall not be able, however, to note more than a few points in relation to these subjects, referring our readers to the work itself for more ample details. The observations of the author on the pathological states of nutrition are highly interesting, and with one or two exceptions, are in entire accordance with our own views. These states, or conditions, may be referred to two principal heads: 1st, deviations of form; 2d, deviations of texture; the first consisting of the several abnormal states of the organism taking place for the most part as a consequence of a defective or excessive energy of its formative powers, or some pervertion of the laws by which they are directed; the second usually proceeding from an exalted or defective irritation of the nutritive apparatus. The subjects which fall under this latter head are the most interesting to the pathologist, as they embrace directly, or indirectly, a large proportion of the lesions which he is called upon to treat. Many of the changes which characterize, or succeed to the condition so vaguely designated inflammation, are referable to this perverted operation of the nutritive functions: by it the tissues are submitted to a condition of atrophy or hypertrophy; may have their meshes altered, their cohesive powers augmented or diminished; may be softened or indurated, or completely broken down and disorganized, as in a full state of ramollisement, or gangrene, and sphacelus. A perverted action of the same apparatus may give rise to a deposition of new molecules within the areolæ of the different tissues, by which their characters may be so far altered as to assume all the attributes of other structures, constituting a natural component of the organism;

or those new molecules may give rise to numerous developments having no natural prototype in the system Lesions appertaining to the first division constitute what are called transformations, or accidental analogous developments: those of the second kind constitute degenerations properly so called, or heteroclyte tissues. This division should be rigidly observed, as much confusion has originated from confounding the homoïoclyte, or analogous products, with the heteroclyte tissues or degenerations.

Dr. Jackson accords with most modern pathologists in regarding the cellular tissue as the proper element and principal seat of most of these accidental developments. It constitutes the rudimentary condition of the entire organism in the embryo, and is, by a series of changes and modifications, transformed into the several natural structures which enter as components into the perfectly-formed subject. Thus far these transformations are healthy, or physiological acts; but those which take place at a later period, which occur in the well-formed tissues, and metamorphose them into the characters of other structures, are pathological, and often involve mischievous consequences.

> "The tissues," observes our author, "are not indiscriminately transformed into each other, but observe a certain relation and order in this respect. The cellular tissue, the common rudimentary element of all the organs, is the most frequent subject of transformation, and may be transformed, by a pathological process, *into every other tissue*. It never, however, passes into nervous tissue, except to replace it at the points where it previously had existed, and to supply the loss of substance; it is in this manner that divided and excised nerves are reproduced." p. 539.

The leading propositions laid down in this extract are unquestionably true—but the author certainly did not mean to affirm, as he has done, that the cellular tissue may be transformed, by a pathological process, into every other tissue. The muscular tissue is, for instance, never developed accidentally by any pathological act of the organism, and the bond of union which is established between divided nerves, cannot, we think, be with strict propriety, viewed as a transformation into a proper nervous tissue, notwithstanding it has been shown by various experiments to be adequate for the transmission of the nervous influence; for it has been satisfactorily demonstrated by Descot, and others, that when a considerable portion of a nerve, say the extent of an inch, has been excised, this restoration does not take place. Now, if it can be accidentally developed, to the extent of supplying the loss of the eighth of an inch, it should, in virtue of the same faculty, be redeveloped to supply the loss of an inch, and with the same facility. We therefore think, that the assertion of the author, relative to these transformations, is too general; and, as regards the muscular tissue, it cannot be sustained.

The degenerations, or heteroclyte tissues, are restricted by Dr. Jackson to two forms; *a*, tubercles; and, *b*, scirrhus or carcinoma. The observations relative to the development of tubercles are ingenious, but not altogether clear. Individuals of the lymphatic temperament are very correctly represented as most liable to them; and those who are endowed with the sanguine temperament in a high degree, and whose blood is rich in fibrine and cruror, are, on the contrary, much more rarely affected by them. But when Dr. Jackson speaks of the "*lymphatic vascular tissue,*" as constituting their most probable seat, and represents them as consisting "of *concrete lymphatic pus*, secreted into the muscles of the cellular tissue," he employs a phraseology which is not likely to be correctly understood, and liable to lead to erroneous conclusions. With regard to the designation which he has applied to the particular vessels concerned, we regret to find him employing the same term which has, unfortunately, led to so much confusion in the writings of Broussais. He, if we understand him rightly, wishes to express by the term lymphatic vessels, those capillaries which are too minute to convey red blood, and which, consequently, circulate a colourless fluid. The term, therefore, having been by common consent, appropriated to the absorbent vessels, which cannot of course secrete the tuberculous matter, is unfortunate, as being liable to convey erroneous impressions upon the subject. The same objections may be urged against the term "*lymphatic pus,*" which has been employed to represent the nature of the new development. The tuberculous matter is a special product, elaborated by a peculiar pathological state of the vessels, and is neither lymph or pus, or a mixture of the two. If we admit these materials as its constituents, we can no longer regard it as a degeneration, but merely a transformation of ordinary pathological secretions.

We cannot concur with the author in the explanation which he has offered relative to the manner in which the tubercles become softened. Whether we regard the changes by which this is accomplished as an act foreign to the tubercles themselves, as he and some others have supposed, or as a consequence of the vital operations taking place in the diseased mass, as represented by Bayle, Laennec and others, certain it is, the mere solvent agency of the secretions poured out by the investing sac, cannot be admitted as an adequate cause of the changes which take place.

The next section of the work is appropriated to the consideration of the secretions, which the author has treated in a very satisfactory manner. We can only afford space for a few of his pathological reflexions, which we think deserve to be attentively considered. The various pathological conditions of the secretions are referred to four heads:—

> "1. Simple increase of the secretion. 2. Vitiation, perversion, or alteration of its qualities. 3. Diminution, or entire suppression. 4. Its displacement, its *error loci*, on appearance in a part where it does not belong." p. *555.*

Numerous exemplifications of each of these pathological states of secretion might be adduced, but we prefer rather to confine ourselves to a few remarks upon the subject of vitiation to which so much importance has been attached by ancient and modern pathologists, and to which has, indeed, been awarded by far the most considerable agency in the development of nearly the whole category of human maladies.

> "The vitiation of the secretions of the alimentary and digestive organs, is assumed, by some modern pathologists, as one of the most important elements in the class of diseases termed by them idiopathic fevers, and as justificatory of the lavish employment, in those affections, of active purgatives. This treatment is objected to by the advocates of the physiological doctrine of fever, who regard the idiopathic fevers of the nosologists as inflammatory irritations of some portion of the mucous tissue of the alimentary canal—that is, gastro-enterites, and purgative medicines as irritants acting on a surface already the seat of an irritation destructive of its functions, and threatening to its organization." p. *557.*

The secretions being dependent for their properties upon the organs or tissues by which they are formed, whatever change or perversion they may undergo, must of course be a mere consequence of some antecedent pathological state of the solids, and must of course continue until the morbid aggression committed on the offending organ shall have been removed. We will not take upon ourselves to deny, that the secretions do in some cases become vitiated to the degree of acquiring properties offensive to the living organism, but we suspect the frequency of this occurrence has been greatly exaggerated, and we concur fully with Dr. Jackson in opinion, that in too many instances—

> "It is most certainly a conjecture merely—that it has not been established by demonstrative proof, and must not, therefore, be admitted as a truth on which to build a theory, or be received as a sanction of unquestionable practice."

He has very correctly remarked, that as the vitiated secretion is a consequence of a highly irritated state of the mucous surfaces, the employment of drastic cathartics, the most intense irritants of the same surfaces, instead of exercising a salutary operation, could not fail to be attended with the same injurious operation as these supposed irritating secretions. Indeed, the organs possess, to a certain extent, the power of adapting themselves to their secretions, and the noxious properties of those products, admitting that they possess such, would be in that manner in a great degree obviated.

We should be pleased to notice the succeeding sections of the work, devoted to the consideration of the subjects of *animal temperature*, the *association* of the *organs* and *functions*, &c., but as we have already trespassed upon the patience of our readers, and have, we fear, extended these observations beyond a proper limit, we must come to a close. We do this with the less reluctance, as we feel assured that the work itself will, ere long, be examined by most of our readers, and from its pages a much more correct estimate of its principles can be obtained than from any observations we could make.

Having accompanied our author through the discussion of the various topics comprised in his work, it only remains for us, before we conclude, to express our opinion of the manner in which he has executed his task. This, though under all circumstances the most delicate, is to us, on the present occasion, the most gratifying part of our labours. We do not arrogate to ourselves the self-sufficiency to affirm, that because the sentiments of the author are in most particulars in accordance with our own, that they are necessarily correct; nor have we the presumption to suppose, that where we have ventured to differ from him, we may not be in error. The whole resolves itself into a mere matter of opinion, in which others may differ from us; but predicating our inferences upon such data as we have been enabled to obtain by an impartial and dispassionate examination of the various subjects which have been passed in review, we are peculiarly gratified in having it in our power to speak in terms of high commendation of the abilities manifested by the author in the execution of his undertaking. If clearness of conception, soundness of principle, and lucidness of detail, constitute the merits of a work, we feel confident in the assertion that the one we have under consideration, will be surpassed in excellence by few, either in this or any other country. Its publication will constitute an important epoch in the history of American medical literature, and no one who is at all ambitious of acquiring sound principles in his profession should fail to avail himself of the opportunity of drawing them from so pure a source. We understand that it is a part of the undertaking of the author to embrace the subjects of pathology and therapeutics. We feel certain, from the high promise presented by his present achievement, that we are only responding the general sentiment of his countrymen, when we assert, that the subsequent part of his labours will be awaited with the greatest anxiety, and hailed with the highest degree of pleasure.

E. G.